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(56) Documents cited

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GB 0579595 A WO 88/05335 A2

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INT CL⁶ B01D 27/06 27/07 29/07

(54) Oil filter and element

(57) A filter element for lubricating oil in an I.C. engine comprises a cylindrical cannister 11 enclosing a roll of paper 21 round a central tube 15. The cannister is open at the top to form an inlet from which oil flows axially through the roll and then radially inwards through layers 18, 19 of porous gauze which space the lower ends of the roll and tube 15 from the base of the cannister. The element is located in a housing through which oil flows from lower inlet 38, up space 56, down through roll 21 into tube 15 and then into perforate mounting tube 41 to outlet 44. The element is mounted on tube 41 between compressed spring 49 and screwed knob 46, prior to screwing tube 41 into outlet 44. Housing lid 36 is then secured by handle 53 which screws on to the top of tube 41. Cannister 11 may have circumferential ribs to inhibit bypassing (Fig. 2).

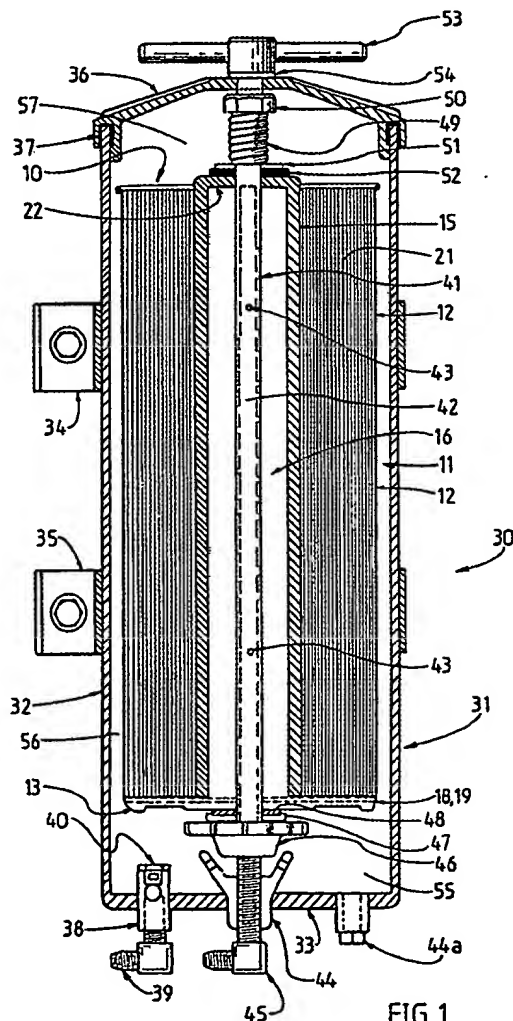


FIG. 1.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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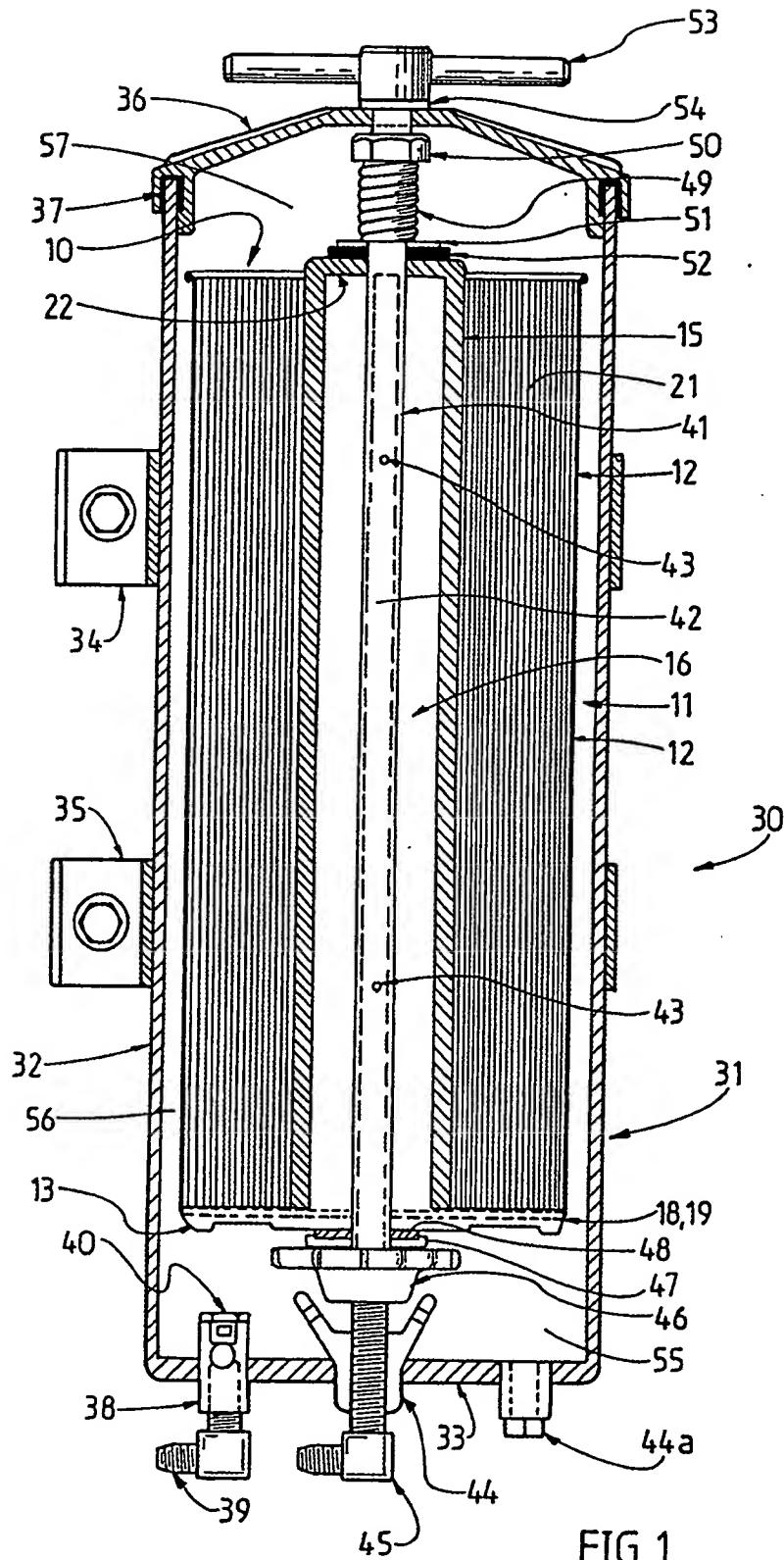
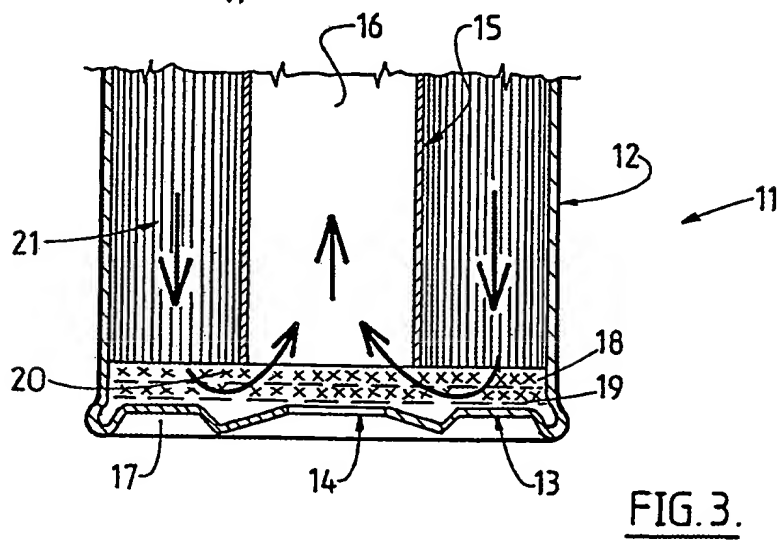
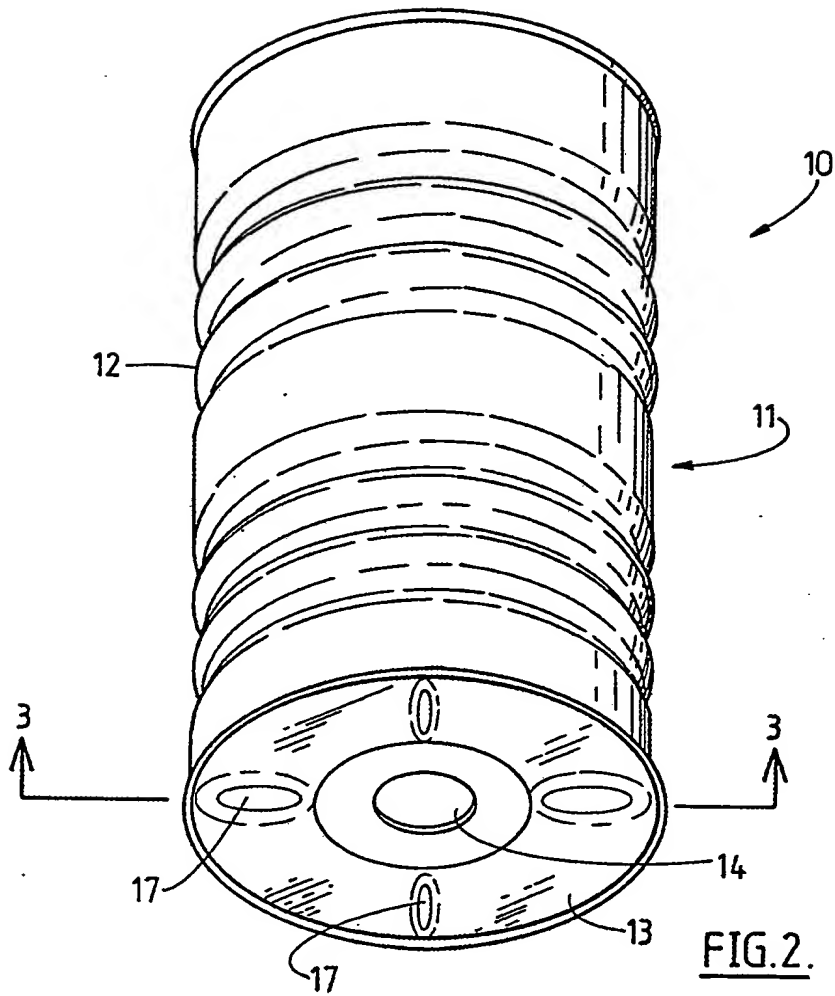


FIG. 1.

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Title: "FLUID FILTERS"

THIS INVENTION relates to fluid filters and to disposable filter elements therefor.

This invention is particularly suitable for, but not limited to, separating solids and/or non-aqueous liquids, as contaminants, from non-aqueous miscible liquids, eg. synthetic or mineral-based lubricating oils. The invention is also applicable, inter alia, to separating solids from aqueous liquids.

At present, when solid contaminants are to be separated from a non-aqueous liquid such as oil, the oil (hereinafter referred to as "feedstock") is passed through a porous filter medium (or barrier) which traps and retains the solids and allows the filtered oil to pass through the pores of the filter medium as the filtrate.

One type of lubricating oil filter commonly in use, (eg. in the transport and mining industries) and sold under the trade mark "Frantz", has one or more rolls of toilet paper (as the filter medium) contained with suitable sized canister(s), as the filter element. The filter elements may be stacked in a filter element assembly and enclosed within a filter body or housing connected to an engine's lubricating system. These filters have the advantage that they can remove solid contaminants as fine as one (1) micron in size.

When the filter medium in such filters becomes overloaded, the filter elements must be changed. The present filters require that the filter medium rolls be removed from the canisters and discarded. The removal of spent rolls is messy, cumbersome and inefficient and may result in the release of contaminants into the environment. Furthermore, when recharging the filter elements with new toilet rolls, the rolls are often partially unwound to make them easier to fit into the

canisters. If the rolls do not effectively seal against the canisters, the filters are prone to operate inefficiently or fail due to the feedstock bypassing the filter medium and/or the contaminants "tracking" down
5 the canister walls past the filter medium.

It is an object of the present invention to provide a disposable filter element for such filters which removes, or at least alleviates, the above mentioned disadvantages.

10 It is a preferred object to provide such a filter element where the packing of the filter medium in the canister is consistent.

It is a still further preferred object to provide such a filter element where the packing of the
15 filter medium in the canister is consistent.

It is a further preferred object to provide a filter incorporating at least one of the filter elements.

Other preferred objects (and advantages) of
20 the present invention will become apparent from the following description.

In one aspect, the present invention resides in a filter element for a filter, the filter element including:

25 a filter canister having an open end (forming an inlet for the filter element) and a closed end;

a centre tube located substantially coaxially within the canister; and

30 a filter medium within the canister, disposed about the centre tube and spaced from the closed end of the canister, so arranged that:

a feedstock to be filtered will pass through the inlet to the filtered medium, and the
35 filtered feedstock or filtrate will pass through a flow

passage, defined by the closed end of the canister and the filter medium, to the centre tube.

Preferably, the filter medium is wound onto the centre tube in sealing engagement with the centre tube and the wall of the canister. Preferably, the feedstock passes substantially axially through the filter medium to the flow passage.

Preferably, the wall of the canister is ribbed or otherwise profiled to deter tracking of the contaminants removed from the feedstock, between the canister wall and the filter medium.

The flow passage may be filled with a material with a high transverse porosity, such as woven gauze.

Preferably, the filter element is disposable, and may be discarded once the filter medium becomes fully charged with trapped and retained solids.

In a second aspect, the present invention resides in a filter for filtering a feedstock including:

a body or housing;

an inlet in the housing to allow a supply of feedstock to be filtered to the housing;

an outlet in the housing to allow flow of filtered feedstock or filtrate from the housing;

at least one filter element as hereinbefore described within the housing; and

filter element installation means providing releasably sealable installation of the filter element(s) in the housing whereby the feedstock flows from the inlet to the outlet through the filter element.

Preferably, the housing is closed at its base and open at its top, the top being closed by a cap fitted with sealing means to engage the wall of the housing.

Preferably, the housing inlet and the housing outlet are at the base of the housing as is a drain port

to enable contaminated feedstock to be drained from the bottom of the housing.

Preferably, the inlet of the (or uppermost) filter element is adjacent the top of the housing so that the feedstock flows from the housing inlet upwardly through an annular passage defined by the wall of the housing and the canister(s) of the filter element(s).

Preferably, a hollow post is disposed coaxially within the housing, and is disposed within, and sealably connected to, the centre tube, the wall of the centre post having fluid communication ports between the outside and the bore thereof, the bore being connected to the housing outlet.

Preferably, sealing means seal against flow of fluid between the housing and the centre tube, so arranged that filtrate in the centre tube flows through the fluid communication ports into the bore of the centre post, and then to the housing outlet.

Preferably, a filter medium retaining ring is provided about the upper end of the centre tube and bears against the top of the filter medium. A compression spring, about the centre post, is preferably interposed between the housing cap and the retaining ring to urge the retaining ring into engagement with the filter medium to seal the upper end of the centre tube and to retain the filter medium in the canister.

Preferably, a pressure knob, screw-threadably mounted on the centre post, bears against the closed end of the canister to urge the filter element upwardly against the compression spring.

Preferably, respective seal means seal the centre post to a coaxial hole through the retaining ring and the closed end of the canister.

The filter medium is preferably a roll of

facial-quality paper tissue of standard size. However, other filter media may be used, such as, but not limited to, cotton, hemp, artificial or synthetic fibres, or any suitable porous or foraminous material.

5 The housing, canister, centre tube, centre post, lid and other hardware are preferably corrosion-resistant metal such as aluminium, stainless steel and the like. However, other materials such as polymeric, ceramic or composite compounds and the like may also be
10 employed.

Preferably, the seals are of an oil resistant elastomer. However, permanently deformed or rigid sealing material may also be used.

The components of the filter element are
15 preferably selected from cost effective materials since they are preferably disposable. The canister may be galvanised or plated steel, plastic, ceramic or composite material, constrained by such requirements as, for example, the necessity to maintain mechanical
20 integrity within the filter housing during the life of the filter element.

In order that this invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings
25 which illustrate the invention, wherein:

FIG 1 is a sectional view of one embodiment of the invention;

FIG 2 is a perspective underside view of a filter element; and

30 FIG 3 is a sectional side view taken on line 3-3 on FIG 2.

Referring to FIGS 1 to 3, the filter element
10 has a canister 11 (eg. of galvanised sheet metal) which has a ribbed side wall 12 and a closed lower end
35 wall 13 with a central bore 14. The upper end of the

canister is open. A centre tube 15 is provided coaxially within the canister and has a bore 16. The lower end of the centre tube is spaced from the end wall 13 by deformations 17 in the end wall 13, and two layers of woven gauze 18, 19 (with light, transverse porosity), to define a flow passage 20 between the end wall 14 and the lower end of the filter medium 21.

The filter medium 21 is a roll of facial-quality tissue paper wound around the centre tube 15 and in sealing engagement with the ribbed wall 12 of the canister 11 to prevent "tracking" of the solid contaminants down the element 10 between the canister wall 12 and filter medium 21.

The centre tube 15 has a filter medium retaining ring 22 at its upper end which extends over the filter medium 21 at the upper (or inlet end) of the filter element to both retain the filter medium 21 in the canister 11 and to sealably connect the centre tube 15 to the filter medium 21.

In use, one or more of the filter elements 10 are fitted to a filter 30 to be hereinafter described with reference to FIG 1.

The filter 30 has a housing 31 of substantially cylindrical shape, with a side wall 32 and closed bottom wall 33 at its base. Brackets 34, 35 are provided to mount the housing 31, eg. on an engine block or vehicle chassis not shown.

The housing 31 is closed at its upper end by a cap 36 provided with a peripheral sealing ring 27 to engage the upper run of the housing side wall 32.

The housing inlet 38 is formed integrally with the bottom wall 33 and is screw-threaded to receive a suitable fitting 29. A one-way check valve 40 in the housing inlet 38 prevents back-pressure within the filter 30 building up within the feed lines to the

filter.

A centre post 41, with an internal bore 42, has a plurality of fluid communication ports 43 through its wall to enable the passage of fluid from the exterior of the centre post 41 to the bore 42. The lower end of the centre post 41 is screw-threadably received in, and sealed to, the housing outlet 44 in the bottom wall 33 of the housing, the outlet 44 being screw-threaded to receive a suitable fitting 45 connected to a fluid return hose (not shown).

A drain plug 44a is also provided in the bottom wall 33 of the housing 31 to enable the contaminated oil, eg. containing water and sludge, to be drained from the housing.

A knurled knob 46 is screw-threadably mounted on the centre post 41 and has a washer 47 and seal 48 to engage the end wall 13 of the filter element 10.

A compression spring 49 is disposed between a nut 50, screw-threadably mounted on the centre post 41, and a washer 51 and seal 52 which engage the filter medium retaining rings 22 on the centre tube 15 of the filter element 10. A handle 53, at the upper end of the centre post 21, is fitted with a seal 54 to sealably secure the lid 36 to the housing 31.

The sealing of the filter element 10 to the centre post 41 is effected by rotation of the knurled knob 46, which compresses the compression spring 49, the fluid medium retaining ring 22 being urged into sealing engagement with the filter medium 21. The sealing of the centre post 41 to the lid 36 and the outlet 44, of the lid 36 to the housing 31, is effected by tightening the handle 53 which engages the threaded end of the centre post 41 within the housing outlet 44, compresses seals 54 and 37 between the handle 53 and the lid 36, and the lid 36 and the housing wall 32, respectively.

The feedstock (eg. engine oil) is introduced to the filter 30 via housing inlet 38 and check valve 40 to a lower plenum 55 in the housing 31. The oil flows upwardly and substantially axially through an annular passageway 56, defined by the canister 11 and the housing side wall 32, to an upper plenum 57. The feedstock then flows downwardly through the inlet of the filter element 10 to pass through the filter medium 21, and any solid contaminants are trapped and retained on, or in, the filter medium 21.

The filtered feedstock or filtrate, which has passed through the filter medium 21, flows substantially radially through the flow passage 20 in the annular spaced defined by the bore 26 of the centre tube 15 of the filter element 10, and the centre post 41.

The filtrate passes through the ports 43 in the centre post 41, down the bore 42 thereof, and out the housing outlet 44 (to be returned to the engine).

The filter 30 according to this invention may be used to separate contaminants from a lubricating or fuel oil by passing the oil through the inlet 30 into the filter as feedstock and allowing at least some of the contaminants to be retained on or in the filter medium 21 and passing the filtered oil out of the filter 30 from the outlet 44 as filtrate.

A filter according to this invention may be assembled from the components thereof by inserting the centre post 41, attached to the lid 36, seal 52 and washer 51 into the centre tube 15 so that the open end of the canister 20 faces the filter medium retaining ring 22, placing seal and washer 47 around the centre post 41 against the closed end of the canister 20, and tightening the knurled knob 46 on the threaded end portion of the centre post 41 against the end wall 13 of canister 10 to compress the spring 49. The filter

element 10, lid 36 and centre post 41 so assembled may then be inserted into the housing 31 by inserting the threaded end portion of the centre post 41 into the threaded bore of outlet 44 and tightening the lid 36
5 onto the top of housing 31.

It will be readily apparent to the skilled addressee that for a higher capacity filter, a plurality of filter elements 10 may be stacked one on top of the other within an (extended length) housing, the
10 respective filter element restraining rings 22 and end walls 13 of the filter elements 10 being sealed to the centre post 31. Spacers may be provided between the filter elements to enable radial flow of the feedstock from the annular passageway 56 and upper plenum 57 into
15 the inlets of the respective filter elements 10, the spacers being sealed to the restraining rings 22 and end walls 13.

It will of course be realised that while the above has been given by way of illustrative example of
20 this invention, modifications and variations thereto as would be apparent to the skilled practitioner in the art are deemed to fall within the broad scope of the invention defined in the appended claims.

CLAIMS

1. A filter element for a filter, the filter element including:

5 a filter canister having an open end (forming an inlet for the filter element) and a closed end;

a centre tube located substantially coaxially within the canister; and

10 a filter medium within the canister, disposed about the centre tube and spaced from the closed end of the canister, so arranged that:

15 a feedstock to be filtered will pass through the inlet to the filter medium, and the filtered feedstock or filtrate will pass through a flow passage defined by the closed end of the canister and the filter medium, to the centre tube.

2. A filter element according to Claim 1 wherein:
the filter medium is wound onto the centre tube in sealing engagement with the centre tube and the wall of the canister; and

20 the feedstock passes substantially axially through the filter medium to the flow passage.

3. A filter element according to Claim 2 wherein:
the wall of the canister is ribbed or
25 otherwise profiled to deter tracking of the contaminants removed from the feedstock, between the canister wall and the filter medium.

4. A filter element according to any one of Claims 1 to 3 wherein:

30 the flow passage is filled with a material with a high transverse porosity, such as woven gauze.

5. A filter element according to any one of Claims 1 to 4 wherein:

35 the filter medium is a roll of facial quality paper tissue, a roll of toilet paper, or cotton,

hemp, artificial or synthetic fibres or other suitable porous or foraminous material.

6. A filter element according to any one of Claims 1 to 5 wherein:

5 the filter element is disposable and is discarded once the filter medium becomes fully charged with trapped and retained solids.

7. A filter for filtering a feedstock including:
a body or housing;

10 an inlet in the housing to allow a supply of feedstock to be filtered to the housing;

an outlet in the housing to allow flow of filtered feedstock or filtrate from the housing;

at least one filter element as claimed in
15 any one of Claims 1 to 6 within the housing; and

filter element installation means providing releasably sealable installation of the filter element(s) in the housing whereby the feedstock flows from the inlet to the outlet through the filter element.

20 8. A filter as claimed in Claim 7, wherein:

the housing is closed at its base and open at its top, the top being closed by a cap fitted with sealing means to engage the wall of the housing.

9. A filter as claimed in Claim 7 or Claim 8
25 wherein:

the housing inlet and the housing outlet are at the base of the housing as is a drain port to enable contaminated feedstock to be drained from the bottom of the housing.

30 10. A filter as claimed in any one of Claims 7 to 9 wherein:

the inlet of the (or uppermost) filter element is adjacent the top of the housing so that the feedstock flows from the housing inlet upwardly through
35 an annular passage defined by the wall of the housing

and the canister(s) of the filter element(s).

11. A filter as claimed in any one of Claims 7 to 10 wherein:

5 a hollow centre post is disposed coaxially within the housing, and is disposed within and sealably connected to, the centre tube, the wall of the centre post having fluid communication ports between the outside and the bore thereof, the bore being connected to the housing outlet.

10 12. A filter according to Claim 11 wherein:

sealing means seal against flow of fluid between the housing and the centre tube, so arranged that filtrate in the centre tube flows through the fluid communication ports into the bore of the centre post, and then to the housing outlet.

15 13. A filter as claimed in Claim 11 or Claim 12 wherein:

a filter medium retaining ring is provided about the upper end of the centre tube and bears against the top of the filter medium;

20 a compression spring, about the centre post is interposed between the housing cap and the retaining ring to urge the retaining ring into engagement with the filter medium to seal the upper end of the centre tube and to retain the filter medium in the canister; and

25 a pressure knob, screw-threadably mounted on the centre post, bears against the closed end of the canister to urge the filter element upwardly against the compression spring.

30 14. A filter as claimed in Claim 13 wherein:

respective seal means seal the centre post to a coaxial hole through a retaining ring and the closed end of the canister.

15. A filter element for a filter substantially as
35 hereinbefore described with reference to the

accompanying drawings.

16. A filter substantially as hereinbefore described with reference to the accompanying drawings.

- 14 -

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

Application number

GB 9222340.3

Relevant Technical fields

(i) UK CI (Edition K) B1D (DBCD, DDAA, DNMC, DNRE, DNRF)

(ii) Int CI (Edition 5) B01D [27/06, 27/07, 29/07]

Search Examiner

R T HAINES

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

6 NOVEMBER 1992

Documents considered relevant following a search in respect of claims

1-16

| Category (see over) | Identity of document and relevant passages | Relevant to claim(s) |
|------------------------|---|-------------------------|
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| X | GB 0883426 (FRANTZ) | 1, 2, 5, 6 |
| X | GB 0783239 (FRANTZ) | 1, 2, 4-8, 11, 12 |
| X | GB 0579595 (BRIGGS) | 1, 2, 5-8 |
| X | WO 88/05335 A2 (COUWENBERGS) see Figure 12 | 1, 2, 4-6 |

SF2(p)

TP - doc99\fil000731

| Category | Identity of document and relevant passages | Relevant to claim(s). |
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Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

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| DERWENT-ACC-NO: | 1993-136615 |
| DERWENT-WEEK: | 199317 |
| <i>COPYRIGHT 2005 DERWENT INFORMATION LTD</i> | |
| TITLE: | Lubricating oil filter, and element for IC engines - in which canister is packed with filter medium for consistency, for synthetic or mineral-based lubricants |

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PATENT-ASSIGNEE: FRANTZ FILTERS MARKETING PTY LTD[FRANN] , LINDBERG P C[LINDI]

PRIORITY-DATA: 1991AU-0009084 (October 23, 1991) , 1994AU-0072890 (September 9, 1994) , 1994AU-0072891 (September 9, 1994)

PATENT-FAMILY:

| PUB-NO | PUB-DATE | LANGUAGE | PAGES | MAIN-IPC |
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APPLICATION-DATA:

| PUB-NO | APPL-DESCRIPTOR | APPL-NO | APPL-DATE |
|--------------------|------------------------|-----------------------|--------------------------|
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| AU 650176B | N/A | AU 9227314 | N/A |
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| AU 656709B | N/A | AU 9472890 | N/A |
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| AU 656710B | N/A | 1994AU-0072891 | September 9, 1994 |
| AU 656710B | N/A | AU 9472891 | N/A |
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| AU 9472891A | N/A | 1994AU-0072891 | September 9, 1994 |
| GB 2260713B | N/A | 1992GB-0022340 | October 23, 1992 |

INT-CL (IPC): B01D027/07, B01D029/07

ABSTRACTED-PUB-NO: GB 2260713A

BASIC-ABSTRACT:

Fluid filters having disposable filter elements, in which the filter element includes (a) a filter canister having an open end (forming an inlet for the

- filter element) and a closed end; (b) a centre tube located coaxially within the canister; and (c) a filter medium within the canister, disposed about the centre tube and spaced from the closed end of the canister; so arranged that (d) a feedstock to be filtered will pass through the inlet to the filtered medium, and the filtered feedstock or filtrate will pass through a flow passage defined by the closed end of the canister and the filter medium, to the centre tube; (e) the filter medium is wound onto the centre tube in sealing engagement with the centre tube and the wall of the canister; and (f) the feedstock passes axially through the filter medium to the flow passage.

ADVANTAGE - A filter element is provided where the packing of the filter medium in the canister is consistent, and a filter is provided incorporating at least one of these filter elements.

ABSTRACTED-PUB-NO: GB 2260713B

EQUIVALENT-ABSTRACTS:

A filter element for a filter, the filter element including: a filter canister having an open end (forming an inlet for the filter element) and a closed end; a centre tube located substantially coaxially within the canister; and a filter medium within the canister, disposed about the centre tube and spaced from the closed end of the canister, so arranged that: a feedstock to be filtered will pass through the inlet to the filter medium, and the filtered feedstock or filtrate will pass through a flow passage defined by the closed end of the canister and the filter medium, to the centre tube; the filter medium is wound onto the centre tube in sealing engagement with the centre tube and the wall of the canister, the wall of the canister being ribbed or otherwise profiled to deter tracking of the contaminants removed from the feedstock, between the canister wall and the filter medium; and the feedstock passes substantially axially through the filter medium to the flow passage.

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|------------------------|--|
| CHOSEN-DRAWING: | Dwg.0/3 Dwg.1/1 |
| TITLE-TERMS: | LUBRICATE OIL FILTER ELEMENT IC ENGINE CANISTER PACK FILTER MEDIUM CONSISTENCY SYNTHETIC MINERAL BASED LUBRICATE |

DERWENT-CLASS: J01

CPI-CODES: J01-F02B;

SECONDARY-ACC-NO:

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